

culturists, and practical foresters of Scotland. In the present volume are a number of practical essays on various points of tree cultivation, and for the current year no fewer than nineteen prizes are offered, the competition for some being limited to working foresters and woodmen.

REFERRING to the statement of the disappearance of Aurora Island, (one of the New Hebrides group), recently printed in the American newspapers, Mr. Tryon exhibited to the Conchological Section of the Academy of Natural Sciences of Philadelphia, at their meeting on January 5th, two species of shells from the collection, supposed to be peculiar to this island, remarking that in the event of the reported submergence of the island being confirmed, these must be classed among the lost species. In his report on the mollusca collected by Wilkes's U.S. Exploring Expedition, we learn from the *American Naturalist*, Dr. Gould gives the following account of Aurora Island:—"The little island of Metia, or Aurora Island, to the northeastward of Tahiti, is one of peculiar interest. It is a coral island which has been elevated two hundred and fifty feet or more, and has no other high island near it. On it were found four small land shells belonging to three genera, viz., *Helix pertenuis*, *Helix Dadalea*, *Partula pusilla*, and *Helicina trochlea*. None of these were found upon any other island. They seem to have originated there, after the elevation of the island, and have a significant bearing upon the question of local and periodical creations in comparatively modern times."

IN these high-pressure days, it is astonishing what a saving in money and temper results from an exact punctuality. One would have thought that in every town which possesses a railway station, precise London time would be kept by the public clocks. This, however, appears to be by no means the case. To remedy this inconvenience, we notice that the Rev. H. Cooper Key is urging on the authorities of Hereford the importance of a daily time signal, preferring a time-gun to the dropping of a ball, as more certain to arrest attention. Certainly every town of the size of Hereford ought to have some means of keeping correct time.

A SLIGHT shock of earthquake was felt in Salvador in Central America on the 24th March, 1^h 45^m. On the night of the 30th there were two shocks, with the sky clear and the moon bright. The Salvador earthquake very nearly coincides with two very severe shocks felt all over the Republic of Chile on the 25th March. Since then other shocks have been felt. In Valparaiso the first earthquake occurred at 11.5 A.M. and lasted about a minute, there being no previous noise. A little after 12 a slight shock was experienced, another shortly after 1, and at 5.30 P.M., a shock as strong as that of the morning; walls were cracked.

On the 26th March there were slight shocks of earthquake at Arquipa, in Peru.

WE have been favoured by the president of the Halifax (Nova Scotia) Institute of Natural Science with a report of their most recent meetings, which will be found in another column. We congratulate the Institute on the good work done by its members in illustrating the natural history, past and present, of the colony.

THE *Pioneer* of Allahabad contains a communication on snake bites. The writer is inclined to believe there is no antidote, but he thinks it useful to put on record an experiment. About three years ago he saw a bullock which had been bitten by a snake and was lying prostrate on the ground retching. Having heard from an old Brahmin that aniseed soonf was a remedy, he was induced to try it. He mixed aniseed 2 chittacks, pepper $\frac{1}{2}$, aniseed leaves 1, aniseed bark 1. This was administered internally with great difficulty down the bullock's throat and externally. In a few minutes the bullock lifted his head, in an hour he stood up and began to chew, and in two hours was all right,

PROF. WYVILLE THOMSON'S INTRODUCTORY LECTURE AT EDINBURGH UNIVERSITY*

IT is too often the first duty of a professor on taking office, to lament the loss of a predecessor who has lately left a blank in the ranks of literature or of science. I am happily relieved from this sad task, for although my friend, Dr. Allman, has found it necessary to retire from the active duties which he has performed so well for many years, his retirement may be looked upon as in a certain sense a gain to science, since he now enjoys a greater amount of leisure to carry on those admirable researches in one of the most difficult and obscure provinces of biology, which have already placed his name high on the roll of those who have added to the store of human knowledge. Although I sincerely trust it may be long before the inevitable time arrives for summing up the labours of George Allman, I believe I may be pardoned if I say a few words about the nature and method of his work, for there is no sounder example which I can cite for your emulation and my own. While keeping pace with the rapid advance of knowledge, and contributing to the general literature of biology the intelligent commentaries and criticisms of an accomplished teacher, Dr. Allman has steadily pursued for many years one special line of research. Whatever he takes up he works out thoroughly and well. His results are fearlessly quoted in all languages as entirely reliable. His straightforward statements and exact descriptions are warped by no preconceived theories, and need no revision or corroboration, and his beautiful drawings are as true to nature as the objects themselves.

No one appreciates more than I do the value of well-founded generalisations. They are the silken threads on which the pearls of truth are strung, and without them we could never realise the full beauty of the gems, their relative value, and their subtle harmonies in form and lustre and tone of colouring; but the first thing is to dive for the pearls, and a good pearl-diver is immortal!

There is another matter to which I wish to refer, and I do so with unmixed pleasure—the appointment of my friend Prof. Geikie to a separate Chair of Physical Geology and Mineralogy in the University. You are all aware that it is to the munificence of Sir Roderick Murchison that this most valuable addition to our teaching staff is due. Sir Roderick Murchison is a Scotchman who has done more to advance the knowledge of geological and geographical science than any other man living. It is needless for me to speak in terms of eulogy of this last benefit which he has conferred upon the cause of scientific instruction in his native country, but I could not from feelings of personal gratitude allow this opportunity to pass of saying that it is to Sir Roderick Murchison that I owe my first encouragement and assistance in Natural Science; and, like all who have received favours at his hands, I have found him a kind and steady friend through life.

We have now in the University three distinct departments of Natural Science, and as it taxes any man's energies to the utmost to keep up with the rapid advance of any one of them, it is of incalculable advantage that their teaching should be in different hands. Broadly speaking, Prof. Geikie now takes the inorganic kingdom of Nature, while Dr. Balfour and I divide biological science between us—Dr. Balfour taking the vegetable kingdom, and I the animal kingdom chiefly. The three subjects, however, meet and inosculate at every point, and the more one branch derives illustration from the other the better. This is especially the case with reference to Physical Geology, and the two departments of biology go between them, and demand full illustration from each. A mass of facts has of late years been developed, which group themselves into a special science of boundless interest—the Science of Palæontology. Still there can be no doubt that Palæontology is simply the biology of the present carried back continuously into the past. I will accordingly, with Prof. Geikie's full concurrence, incorporate pure Palæozoology with my Zoology course, and my colleague, Prof. Balfour, will doubtless do the same by Palæophytology; and we shall both materially trespass upon the domain of Prof. Geikie for the necessary illustration which his special subject affords, fully aware that he must make even heavier requisitions upon us.

Gentlemen, I have already alluded to the division of the Natural Science group of subjects into three—the study of inorganic nature from a natural history point of view, and the study

* Introductory Lecture to the Natural History Class, By Prof. Wyville Thomson, LL.D., D.Sc., F.R.S.

of the two organic kingdoms. As a certain amount of latitude is allowed in a first lecture, I will crave your indulgence while I direct your attention for a few minutes to a group of forms which are said to belong to none of these kingdoms, and to form a kind of Bohemia of their own.

Prof. Ernst Haeckel of Jena, one of the most profoundly learned naturalists and one of the most sensible thinkers of the day, advocates the separation into a distinct kingdom of an immense series of simple organisms, some of which had been hitherto regarded as plants and others as animals.

Prof. Haeckel's opinion on a matter of this kind is of the highest value, not because he has made a bold and certainly premature attempt to rearrange the universe on Darwinian principles, but because he has been a most sagacious and careful student of the lower forms of life. He has raised for himself a monument in his wonderful monograph of the Radiolaria, which will endure along with Darwin's researches on coral reefs and on the Cirripeds, when the Darwinian theory of modification through Natural Selection may possibly be remembered only as one of the most brilliant of those broken lights which have been shed from time to time by gifted men on the plan of the Divine Creator.

According to Professor Haeckel, the material universe, so far as we at present know it, resolves itself into minerals, protista, plants, and animals. I may say at starting that, along with most of my brother naturalists in Britain, I regard the introduction of this new "kingdom," the Protista, as a mistake; but as the proposal even involves most interesting questions as to the relations between the three recognised kingdoms, it is well worthy of careful consideration. Haeckel ranges among the Protista the Monera, a group of peculiar forms, of which he himself has been the most successful student, and these may be taken as the type of the "Protistenreich;" the protoplasta, containing amoeba, diffugia and their allies; the diatoms, the flagellate infusoria; the fungi; the noctiluca; and the rhizopoda.

It is foreign to my present purpose to trace in detail the various steps by which our views of the ultimate process of organisation have been modified during the last few years; how after the publication of the brilliant observations of Schleiden and Schwann, the nucleated cell was almost universally regarded as the physiological unit; how the researches of Max Schultze, Leydig, Beale, and Hofmeister gradually shook our faith in the earlier conceptions of this cell-unit, and did away at all events with the necessity of a cell-wall, proving such a wall, when it existed, to be an excretion, and showing that the vital activity of the cell resided solely in the nucleated spherule of contractile sarcode which forms the cell-contents of every living cell—and how finally Cohn, Max Schultze, Huxley, and Haeckel cast doubts upon the value of the nucleus and upon the necessity of any cell-like limitation, and seemed to render the view highly probable that the vital activity of all organisms, even of the most highly organised, resides essentially and ultimately in a diffused homogeneous "germinal matter," or "protoplasm," of which all formed tissues are modifications or excretions.

It is impossible in the present state of knowledge to subject any view as to the ultimate mechanism of the formation of tissue through the means of protoplasm to direct proof. It seems now to be a very generally received opinion, supported by Huxley, Max Schultze, Hofmeister, Beale, and many others, and notably by Oscar Schmidt, who would seem to bring it almost to demonstration in his beautiful researches on the sponges of the Adriatic, that protoplasm is simply converted, with a certain change of composition, into tissue or "formed material." There are, however, almost insuperable objections to this view. The secondary products of organisation (formed material) are most various in their chemical constitutions, and it involves the admission that protoplasm may change in its chemical composition till it is almost carbonate of lime, or silica, or starch, or horn, or cellulose; the last stage of the metamorphosis being its absolute separation as one or other of these bodies. Another view which I have always regarded as more probable is that protoplasm, the substance which is endowed with the peculiar vital property, has always the same composition, and that it acts simply by catalysis, inducing, under certain known laws, decomposition and recombination in compounds which are subjected to its influence, without itself undergoing any change, absorbing the nascent products of combination and decomposition, and recombining them and reserving them with reference to the development or maintenance of the organ to which it gives its life.

The researches of Prof. Haeckel on the Monera have perhaps

been of higher value in support of the protoplasm view than any others, for they have given abundant proof that independent beings may exist and may show all the essential phenomena of life without the slightest trace of differentiation of any part of their substance into investing wall or nucleus or distinguishable part of any kind, simply as masses of contractile jelly, particles of albumin endowed with the faculties of nutrition and reproduction.

The positive character to which Prof. Haeckel trusts for the definition of his protista kingdom is the entire absence in all the groups which it contains of sexual reproduction. He contends that all protista are monogenetic, reproducing by gemmation or fission alone. This character he conceives separates them definitely from true animals and true plants. Before passing to the consideration of the general relations of the animal and vegetable kingdoms and the position of these questionable forms, I wish to say that I do not attach much importance to this negative character. Of late years enormous advances have been made in our knowledge of the process of reproduction in lower organisms, and we find that multiplication by gemmation in various forms is infinitely more common than was supposed; that in some cases multitudes of individuals and apparently several generations are reproduced by gemmation alone, without the intervention of sexual reproduction; but at the same time I believe that the tendency of modern research is to make it more and more probable that in all cases conjugation or some other form of sexual reproduction comes in at some part of a definite or indefinite series of broods, and starts as it were an entirely new stock. I am inclined to think that in those cases where we find only monogeny, it is probably from a want of knowledge of the life history, not of an individual, but of a complete cycle of individuals. Besides, the reproductive process in some of these lower forms is very obscure. Not many years ago, accepting Prof. Haeckel's test, all the orders of cryptogamic plants would have belonged to the protista. Who could have anticipated the obscure and beautiful process of fertilisation in ferns? It seems scarcely possible that there should be no equivalent process in fungi, if we could only find it out.

Let us now consider for a moment the characters on which the older kingdoms have been founded, and see how they have stood the test of advancing knowledge. We shall thus be the better able to judge of the stability or otherwise of the proposed new kingdom.

The consideration of the inorganic kingdom need not, I think, detain us long. Any two groups of things conceivable must have some analogies or resemblances; but it seems to me that any essential relations which have been founded on the resemblances between inorganic substances and organised beings are purely fanciful. Of course, it is impossible to say that a point of continuity may not be discovered, but as yet the boundary line seems sufficiently trenchant.

Inorganic substances never *live*, they are either simple (according to our present state of knowledge) or they may originate from the combination of two or more substances which unite in definite proportions; they may exist in any physical condition from solid to gaseous, but they are homogeneous, that is to say, any portion which may be detached exactly resembles the remainder in composition and in properties; they increase by the addition of like particles from without to the external surface; they may be indefinite in external form or amorphous, but almost universally they tend to assume the form of regular geometric solids bounded by planes, which have a definite relation to one another in position—to crystallise. Internally inorganic substances are at rest, unless their atoms be set in motion, or unless they be otherwise affected by forces acting from without; they initiate no motion nor change. If one could imagine a quartz crystal absolutely isolated from all external influences, it might remain unchanged for ever.

An organised being, on the other hand, either *lives* or has lived during some part of its existence; if living, every part of it is in constant motion and change; it increases by the imbibition of heterogeneous matter from without, by its assimilation, and by the intercalation of the particles of the assimilated food among the particles of the substance already laid down, by molecular intussusception; and old molecules which have undergone change are constantly being removed and replaced by new ones. An organised being always contains a mixture of solids, liquids, and gases; it is never homogeneous nor uniform in structure, but consists of structural elements which are distinct in character, and each of which has its part to play in the production and regulation of the movements

and changes which are unceasing; it always contains certain substances in what is called "unstable equilibrium," which become decomposed and reduced to more stable compounds the moment the peculiar vital property is lost. An organised being is not produced by the direct union of definite proportions of two or more simple substances; it arises by the growth of a germ, a portion separated from the body of a pre-existing organised being of the same kind. Finally, organised beings never assume accurate geometrical forms, but under the influence of life each kind of organised being assumes a characteristic, though not absolutely definite shape, which is the resultant of the sum of the shapes of all its structural elements, which has a very close relation to the shape of the organised being from which it was derived as a germ, though it is not identical with it, and which is called its individual form.

I have thus far contrasted inert matter with organised beings possessing life. That the term life indicates a very special property there can be no doubt, but, as yet, an impenetrable veil seems to shroud its ultimate processes. I believe, however, that the veil is at the far end of the labyrinth in which we are now wandering, and that patient observation and guarded generalisation may yet enable us greatly to narrow the limits of the unknown—to approach some steps nearer to the veil. I must premise that, as I am now looking at the subject from a purely physiological point of view, I regard life simply as a condition capable of producing certain perceptible phenomena, and can take no cognizance whatever of that mysterious union between spirit and matter which is broken in passing through "the valley of the shadow of death." Material processes and material changes only are subject to the material instruments of biological research. Those inner mysteries are now and must probably ever remain—in our present condition of existence—beyond the veil.

It becomes daily more manifest with the advance of knowledge that the action of known physical laws—such as chemical affinity and capillarity as manifested by porous media and by colloids—are most intimately interwoven with all organic processes, and it is, as yet, impossible to say how far life may influence, in the sense of modifying or directing, the action of these laws. Life has been called the vital force, and it has been suggested that it may be found to belong to the same category as the convertible forces heat and light. Life seems, however, to be more a property of matter in a certain state of combination than a force. It does no work in the ordinary sense. If a man lift a weight a couple of feet off the ground, many of the so-called vital actions are called into play, but yet every part of the work done can be accounted for by the action of the ordinary physical forces. The act of the will, in legal phrase the "mere motion," which induced the lifting of the weight, can be referred, we can scarcely doubt, to the mechanical action of some part of a large and complicated apparatus, the cerebral hemispheres, and was accompanied by a waste of its substance.

The telegraphic communication to the muscles involved which harmonised their several acts and signalled the contraction of their fibres, was conveyed through a cord whose molecules were set in vibration by a force very probably convertible with the physical forces, generated by chemical change and the waste of tissue; and in the muscle, the organ by which the weight was actually raised, an amount of waste took place—that is to say, an amount of carbon was combined with oxygen precisely equivalent theoretically to the quantity of coal which must have been burned in a perfectly constructed engine to do the same work.

Chemical forces act in living beings under very special circumstances. For a series of years a mass of substances are held undergoing constant change and throughout in the most unstable state of chemical combination. The instant the condition of life is removed, decomposition commences, and the complex constituents of the body are resolved into more simple and stable combinations. But yet it may be fairly questioned whether the chemical relations of the component elements of an organised body are in any way directly affected or controlled by life. It has become quite conceivable, especially through the researches of the late Master of the Mint, that a constant adjustment and re-adjustment of membranous and colloid diaphragms in the presence of powerful catalytic agents may possibly explain the maintenance of almost any chemical conditions however complicated.

The one function of living beings whose explanation it seems at present impossible to imagine except by regarding it as the manifestation of a special property, is what has been called the "moulding of specific form;" the building up of a hetero-

geneous and complicated organism, which shall repeat, not rigidly but with a certain flexibility, the characters which have been transmitted to it through a germ from a parent, every molecule of every part having thus a direct relation in form, in position, and in composition, to every other molecule of the body. At present, regarding it from a purely material point of view, we are scarcely justified in regarding life as more than that condition of an organised being in which the products of chemical and physical changes taking place within it are stamped with a specific organic form.

(To be continued.)

SCIENTIFIC SERIALS

Journal of the Ethnological Society of London (January 1871). A paper by Mr. E. B. Tylor on "The Philosophy of Religion among the lower Races of Mankind" gives in a condensed form his views on the development of "Animism," i.e. the doctrine of the soul, and of spirit and deity in general, a subject which is treated at length in his recently published work on "Primitive Culture."—Prof. Huxley's address on the "Geographical Distribution of the Chief Modifications of Mankind" is accompanied by an ethnological map, which curators and lecturers will do well to adopt as a wall-map. The principal races of mankind are defined as the Australioid, Negroid, Mongoloid, and the Xanthochroic and Melanochroic (fair and dark whites.) Among the special features in Prof. Huxley's scheme of the races of mankind, the following are prominent. The indigenous non-Aryan tribes of Central and Southern India, and less closely the ancient Egyptians and their descendants, the modern Fellahs, are referred to the Australioid type. The Negroid type of Africa is divided between the Negroes proper and the Bushmen of the extreme south, the Hottentots being considered a cross-breed between these two races. The Mongoloid type is made to include not only the brachycephalic Tatar races, but classification by skulls is set aside, and the group is arranged to include the Chinese and Japanese. The "absurd denomination" of "Caucasian" is abandoned, and the nations thus described by ethnologists come under the titles of Xanthochroi, fair whites, who are classed as of special type, and Melanochroi, dark whites, which latter Prof. Huxley is disposed to consider as sprung from intermixture of Xanthochroi and Australioids. In this classification of human types or races, Prof. Huxley rests on physical characteristics, treating language as subordinate. In his remarks on "The Ethnology of Britain" he again states his views as to the great division of European men between the fair whites of the centre and west, and the dark whites of the south. Both types occur in the early population of our islands, the use of Celtic language not corresponding with a racial distinction.—Dr. Nicholas's paper on the "Influence of the Norman Conquest on the Ethnology of Britain" is in strong antagonism to the view that Englishmen are ethnologically "Low Dutch." In his view, the old British race, in great measure, kept its early type, the Saxon, Danish, and Norman invasions affecting language, government, &c., rather than replacing the population itself.—Among the papers on Prehistoric Archaeology are Sir John Lubbock's description of the Park Cwm Tumulus, and an account of remains of "Platycnemid Men in Denbighshire," by Mr. W. Boyd Dawkins and Prof. Busk.—Canon Greenwell's paper on "The Opening of Grime's Graves in Norfolk," gives full particulars as to the site of a Stone Age manufactory of implements from the excellent flint of the district. The chalk was systematically mined for the flint, and the so-called "Grime's Graves" are ancient pit-workings of this class. Colonel Lane Fox is disposed to explain in the same way the "Dane's Holes" in Kent, long a puzzle to antiquaries.—Looking at the number of the journal of the Ethnological Society, it is to be hoped that the journal of the new Anthropological Institute will maintain its very high standard of succinctness, solidity, and general interest.

The *Geological Magazine* for the present month (No. 83) contains only four original articles, of which the first is an account by the editor, Mr. H. Woodward, of the objects which more particularly attracted his attention during a recent visit to the Brussels Museum. He notices especially the fossils of the Antwerp crag, and a fine example of the mammoth found at Liere, in the province of Antwerp, in a sufficiently perfect state to be mounted as a skeleton. Two figures of this interesting specimen are given. Mr. Woodward also refers to